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EPA Office of Compliance Sector Notebook Project

Profile of the Fossil Fuel Electric Power Generation Industry

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Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
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Cover photograph courtesy of Arizona Electric Power Cooperative, Inc.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACAA	American Coal Ash Association
AEE	Association of Energy Engineers
AEPCO	Arizona Electric Power Cooperative
AFS	AIRS Facility Subsystem (CAA database)
AIRS	Aerometric Information Retrieval System (CAA database)
APPA	American Public Power Association
ANL	Argonne National Laboratory
BACT	Best Available Control Technology
BIFs	Boilers and Industrial Furnaces (RCRA)
BOD	Biochemical Oxygen Demand
BPJ	Best Professional Judgment
BTU	British Thermal Unit
CAA	Clean Air Act
CAAA	Clean Air Act Amendments of 1990
$CaCl_2$	Calcium Chloride
CAPI	Clean Air Power Initiative
CCGT	Combined-Cycle Gas Turbine
CCP	Coal Combustion Product
CCT	Clean Coal Technology Demonstration Project (DOE)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	CERCLA Information System
CEQ	Council for Environmental Quality
CFC	Chlorofluorocarbon
CHIEFs	Clearing House of Inventory Emissions Factors
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CP&L	Carolina Power and Light
CSI	Common Sense Initiative
CWA	Clean Water Act
D&B	Dun and Bradstreet Marketing Index
DOE	Department of Energy
DSA	Dimensionally stable
DSM	Demand Side Management
EA	Environmental Assessment
EDS	Effluent Data Statistics System
EEI	Edison Electric Institute
EIA	Energy Information Administration (DOE)
EIS	Environmental Impact Statement
ELP	Environmental Leadership Program
EMS	Environmental Management System

EPA	U.S. Environmental Protection Agency
EPACT	Energy Policy Act of 1992
EPCRA	Emergency Planning and Community Right-to-Know Act
EPRI	Electric Power Research Institute
EPSA	Electric Power Supply Association
EWG	Exempt Wholesale Generators
FAC	Free Available Chlorine
FBC	Fluidized Bed Combustion
FERC	Federal Energy Regulatory Commission
FGD	Flue Gas Desulfurization
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FINDS	Facility Indexing System
FONSI	Finding of No Significant Impact
HAPs	Hazardous Air Pollutants (CAA)
HCFC	Hydrochloroflourocarbon
HSDB	Hazardous Substances Data Bank
HSWA	Hazardous and Solid Waste Amendments of 1984
IDEA	Integrated Data for Enforcement Analysis
ICCR	Industrial Combustion Coordinated Rulemaking
IGCC	Integrated Coal Gasification Combined-cycle
IPP	Independent Power Producer
KW	Kilowatt
LAER	Lowest Achievable Emissions Rate
LDR	Land Disposal Restrictions (RCRA)
LEPC	Local Emergency Planning Committee
MACT	Maximum Achievable Control Technology (CAA)
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MEK	Methyl Ethyl Ketone
MSDS	Material Safety Data Sheet
MW	Megawatt
NAAQS	National Ambient Air Quality Standards (CAA)
NAFCOG	North American Fuel Cell Owner Group
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NCDB	National Compliance Database (for TSCA, FIFRA, EPCRA)
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NERC	North American Reliability Council
NEIC	National Enforcement Investigation Center
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGFC	Natural Gas Fuel Cell
NMHC	Non-Methane Hydrocarbon
NO_2	Nitrogen Dioxide
NOV	Notice of Violation

NO_X	Nitrogen Oxide
NPDES	National Pollutant Discharge Elimination System (CWA)
NPL	National Priorities List
NRECA	National Rural Electric Cooperative Association
NRC	National Response Center
NSR	New Source Review
NSPS	New Source Performance Standards (CAA)
OAR	Office of Air and Radiation
OAQPS	Office of Air Quality Planning and Standards
OECA	Office of Enforcement and Compliance Assurance
OIT	Office of Industrial Technology (DOE)
OPA	Oil Pollution Act
OPPTS	Office of Prevention, Pesticides, and Toxic Substances
OSHA	Occupational Safety and Health Administration
OSW	Office of Solid Waste
OSWER	Office of Solid Waste and Emergency Response
OTAG	Ozone Transport Assessment Group
OW	Office of Water
P2	Pollution Prevention
PAH	Polycyclic Aromatic Hydrocarbon
Pb	Lead
PCB	Polychlorinated Biphenyl
PCS	Permit Compliance System (CWA Database)
PEPCO	Potomac Electric Power Company
PETC	Pittsburgh Energy Technology Center
PM	Particulate Matter
PMN	Premanufacture Notice
POTW	Publicly Owned Treatment Works
PSD	Prevention of Significant Deterioration (CAA)
PSES	Pretreatment Standards for Existing Sources
PSNS	Pretreatment Standards for New Sources
PSE&G	Public Service Electric and Gas
PT	Total Particulate Emissions
PUHCA	Public Utility Holding Company Act
PURPA	Public Utility Regulatory Policies Act
QF	Qualifying Facility (PURPA)
RACT	Reasonably Achievable Control Technology
RCRA	Resource Conservation and Recovery Act
RCRIS	RCRA Information System
RDF	Refuse Derived Fuel
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SEP	Supplementary Environmental Project
SERC	State Emergency Response Commission
SIC	Standard Industrial Classification

SIP	State Implementation Plan (CAA)
SO_2	Sulfur Dioxide
SO_X	Sulfur Oxides
TCRIS	Toxic Chemical Release Inventory System
TDSS	Total Dissolved Suspended Solids
TOC	Total Organic Carbon
TRC	Total Residual Chlorine
TRI	Toxic Release Inventory
TRIS	Toxic Release Inventory System
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, or Disposal Facility (RCRA)
TSS	Total Suspended Solids
UARG	Utility Air Regulatory Group
UIC	Underground Injection Control (SDWA)
UST	Underground Storage Tanks (RCRA)
USWAG	Utility Solid Waste Activities Group
UWAG	Utility Water Act Group
VOC	Volatile Organic Compound

FOSSIL FUEL ELECTRIC POWER GENERATION INDUSTRY (SIC 4911, 493)

I. INTRODUCTION TO THE SECTOR NOTEBOOK PROJECT

I.A. Summary of the Sector Notebook Project

Integrated environmental policies based upon comprehensive analysis of air, water, and land pollution are a logical supplement to traditional single-media approaches to environmental protection. Environmental regulatory agencies are beginning to embrace comprehensive, multi-statute solutions to facility permitting, enforcement and compliance assurance, education/outreach, research, and regulatory development issues. The central concepts driving the new policy direction are that pollutant releases to each environmental medium (i.e., air, water, and land) affect each other and that environmental strategies must actively identify and address these inter-relationships by designing policies for the "whole" facility. One way to achieve a whole facility focus is to design environmental policies for similar industrial facilities. By doing so, environmental concerns that are common to the manufacturing of similar products can be addressed in a comprehensive manner. Recognition of the need to develop the industrial "sector-based" approach within the U.S. Environmental Protection Agency (EPA) Office of Compliance led to the creation of this document.

The Sector Notebook Project was originally initiated by the Office of Compliance within the Office of Enforcement and Compliance Assurance (OECA) to provide its staff and managers with summary information for 18 specific industrial sectors. As other EPA offices, states, the regulated community, environmental groups, and the public became interested in this project, the scope of the original project was expanded to its current form. The ability to design comprehensive, common sense environmental protection measures for specific industries depends on knowledge of several interrelated topics. For the purposes of this project, the key elements chosen for inclusion are general industry information (economic and geographic); a description of industrial processes; pollution outputs; pollution prevention opportunities; Federal statutory and regulatory framework; compliance history; and a description of partnerships that have been formed between regulatory agencies, the regulated community, and the public.

For any given industry, each topic listed above could alone be the subject of a lengthy volume. However, in order to produce a manageable document, however, this project focuses on providing summary information for each topic. This format provides the reader with a synopsis of each issue and references where more in-depth information is available. Text within each profile was researched from a variety of sources and was usually condensed

from more detailed sources pertaining to specific topics. This approach allows for a wide coverage of activities that can be further explored based upon the citations and references listed at the end of this profile. To check the information included, each notebook went through an external review process. The Office of Compliance appreciates the efforts of all those who participated in this process who enabled the development of more complete, accurate, and up-to-date summaries. Many of those who reviewed this notebook are listed as contacts in Section IX and may be sources of additional information. The individuals and groups on this list do not necessarily concur with all statements within this notebook.

I.B. Additional Information

Providing Comments

The OECA Office of Compliance plans to periodically review and update the notebooks and will make these updates available both in hard copy and electronically. If you have any comments on the existing notebook, or if you would like to provide additional information, please send a hard copy and computer disk to the EPA Office of Compliance, Sector Notebook Project (2223-A), 401 M Street, SW, Washington, DC 20460. Comments can also be uploaded to the Enviroene World Wide Web for general access to all users of the system. Follow instructions in Appendix A for accessing this system. Once you have logged in, procedures for uploading text are available from the on-line Enviroene Help System.

Adapting Notebooks to Particular Needs

The scope of the industry sector described in this notebook approximates the national occurrence of facility types within the sector. In many instances, industries within specific geographic regions or states may have unique characteristics that are not fully captured in these profiles. The Office of Compliance encourages state and local environmental agencies and other groups to supplement or repackage the information included in this notebook to include more specific industrial and regulatory information that may be available. Additionally, interested states may want to supplement the "Summary of Applicable Federal Statutes and Regulations" section with state and local requirements. Compliance or technical assistance providers may also want to develop the "Pollution Prevention" section in more detail. Please contact the appropriate specialist listed on the opening page of this notebook if your office is interested in assisting us in further development of the information or policies addressed within this volume. If you are interested in assisting in the development of new notebooks for sectors not covered in the original 18, please contact the Office of Compliance at (202) 564-2395.

II. INTRODUCTION TO THE FOSSIL FUEL ELECTRIC POWER GENERATION INDUSTRY

This Sector Notebook addresses the fossil fuel electric power generation industry, which comprises the majority of the total electric power generation industry. This subset of the industry includes only facilities that use either coal, petroleum, or gas as the energy source to generate electricity and does not include facilities that use nuclear or renewable (e.g., wood, solar) energy sources exclusively. However, this subset would include power generation activities at facilities that use both fossil fuels and another energy source. In addition, the scope of this profile is further limited to address only those facilities that generate electricity either as a primary activity or as an ancillary activity. The profile does not include facilities and activities associated with the transmission and distribution of electricity.

II.A Introduction, Background, and Scope of the Notebook

Fossil fuel electric power generation facilities are classified under Standard Industrial Classification (SIC) code 49, which includes establishments engaged in electric, gas, and sanitary services. These facilities can be further classified under the following three- and four-digit SIC codes from the *Standard Industrial Classification (SIC) Manual* of the Office of Management and Budget.

- **SIC 4911 - Electric Services**: Establishments that are engaged in the generation, transmission, and/or distribution of electric energy for sale.

- **SIC 493 - Combination Electric and Gas, and Other Utility Services**: Establishments providing electric or gas services in combination with other services. Establishments are classified here only if one service does not constitute at least 95 percent of revenues.

It should be noted that these SIC codes do not make the necessary distinctions between fuels used and generation versus transmission and distribution activities. Data available to characterize the fossil fuel electric power generation industry that use these SIC codes also may not distinguish between these categories of facilities. Where these categories of facilities and/or activities cannot be distinguished in the available data, it will be so noted within the profile.

Fossil fuel electric power generation facilities are also classified under a new system called the North American Industry Classification System (NAICS), which replaced the existing SIC codes in January 1997. The NAICS classification code for fossil fuel electric power generation is 221112.

Power generation facilities and activities exist in association with both traditional utilities or nonutility power producers. Traditional utilities are the regulated industry that produces and provides electricity for public use. Prior to 1980, nonutilities consisted of industrial manufacturers that produced electricity for their own use. Currently, nonutilities not only consist of industrial manufacturers, but also other industrial groups that provide electricity and other services for their own use and/or for sale to others. These categories are discussed further below.

This section provides background information on the size, geographic distribution, electricity production, sales, and economic condition of the fossil fuel electric power generation industry. The type of facilities described within the document are also described in terms of their SIC codes. Additionally, this section lists the largest companies in terms of sales.

II.B Characterization of the Fossil Fuel Electric Power Generation Industry

The U.S. Department of Energy's (DOE) Energy Information Administration (EIA) collects, evaluates, and disseminates information on the fossil fuel electric power generation industry. This information is published annually. In addition, industry trade associations collect information.

Available statistics on the fossil fuel electric power generation industry typically characterize the industry in terms of capacity, generating capability, net generation, and revenues. These terms are defined as follows:

- **Capacity** is the amount of electric power delivered or required for which a generator, turbine, or system has been rated by the manufacturer.

- **Capability** is the maximum load that a generating unit can be expected to carry under specified conditions for a given period of time without exceeding approved limits of temperature or stress. The net capability of a generating unit is always less than the rated capacity.

- **Net generation** is the total amount of electricity generated minus the electricity used by the facility itself.

- **Revenue** is the total amount of money received by a firm from sales of its products and/or services, gains from the sales or exchange assets, interest and dividends earned on investments, and other increases in the owner's equity except those arising from capital adjustments.

The following sections briefly summarize information available to characterize the industry.

II.B.1 Product Characterization

The product in fossil fuel electric power generation is electricity. Ancillary activities associated with the generation of electricity may generate other products, however. For example, cogeneration systems produce electricity, as well as another form of usable energy (i.e., steam or heat). In addition, utilities with SIC code 493 may produce other products, such as gas. These other products are beyond the scope of this profile.

II.B.2 Industry Size and Geographic Distribution of the Fossil Fuel Electric Power Generation Industry

In general, the power generation industry comprises both traditional and nontraditional electric-producing companies. They are called "utility" and "nonutility" power producers, respectively. A key difference between utilities and nonutilities is that utilities own generation, transmission, and distribution functions. Thus, utilities are "vertically" oriented. Nonutilities, on the other hand, generally own only generation capabilities. Often, the nonutilities must rely on utilities to sell the electricity they produce.

A utility power producer is generally defined as any person, corporation, municipality, State political subdivision or agency, irrigation project, Federal power administration, or other legal entity that is primarily engaged in the retail or wholesale sale, exchange, and/or transmission of electric energy. In 1995, there were 3,199 utilities in the United States; however, only 700 of these utilities generated electric power. The remainder were electric utilities that purchased wholesale power from others for the purpose of distribution over their lines to the ultimate consumer. The 700 utilities that generated power had a total of 3,094 power plants or stations.[1]

A nonutility power producer is defined as any person, corporation, municipality, State political subdivision or agency, Federal agency, or other legal entity that either (1) produces electric energy at a qualifying facility (QF)[a] as defined under the Public Utility Regulatory Policies Act (PURPA) or (2) produces electric energy but is primarily engaged in business activities other than the sale of electricity. In 1995, there were 4,190 nonutility power-generating facilities. Generation by nonutility power producers accounted for approximately 12 percent of the total U.S. electric generation. Fifty-six percent of the electricity generated by nonutilities was sold to electric utilities.[2]

[a] To receive status as a QF under PURPA, a facility must meet certain ownership, thermal output size, and efficiency criteria established by the Federal Energy Regulatory Commission (FERC). QFs are guaranteed that electric utilities will purchase their output at a reasonable price.

Table 1 provides electric power generation statistics for the year 1995 that allows comparison between electric power generation by both utilities and nonutilities based on the fuels used.

Table 1: Comparison of Utility and Nonutility Electric Power Generation (1995)

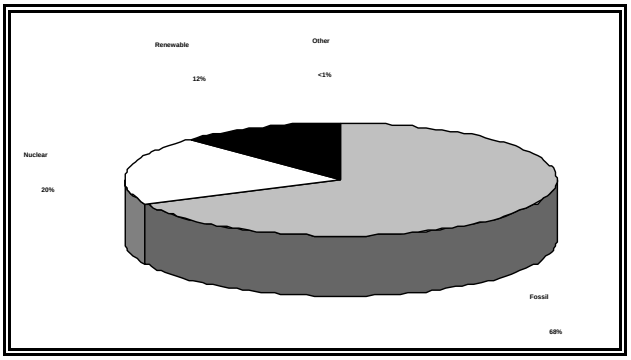
Energy Source	Utility Generation (thousand megawatthours)	Nonutility Generation (thousand megawatthours)***	Total U.S. Generation (thousand megawatthours)***
Fossil	2,021,064	287,696	2,308,760
Nuclear	673,402	—(†)	673,402
Hydroelectric*	293,653	14,515	308,168
Renewable and other**	6,409	98,295	104,704
Total	**2,994,528**	**400,505**	**3,395,033**

* Includes hydroelectric, conventional, and pumped storage.
** Includes geothermal, solar, waste, wind, photovoltaic, and biomass; projects for which there were two primary energy sources; and projects that did not identify the primary energy source. Nonutility data includes nuclear.
*** Totals may not equal sum of components because of independent rounding.
† Nonutility facilities using nuclear are including under "Renewable and other."

Sources: (a) *Electric Power Annual, 1995, Volume 1.* U.S. Department of Energy, Energy Information Administration, Washington, DC. July 1996. DOE/EIA-0348(95/1); and (b) *1995 Capacity and Generation of Non-Utility Sources of Energy*. Prepared by the Edison Electric Institute, Washington, DC. November 1996.

Based on these numbers and as shown in Figure 1, fossil fuel electric power generation represented 68 percent of the total U.S. electric power generation industry's total production of electricity in that year (both utility and nonutility combined). Nuclear energy represented 20 percent, renewable energy sources represented about 12 percent, and other energy sources represented less than 1 percent of the electricity production.

Figure 1: Total Utility and Nonutility Electric Power Net Generation Based on Fuels (1995)



In general, statistics on utility and nonutility electric power production are not aggregated. The following sections provide a more in-depth discussion of the information available to characterize the utility and nonutility electric power generators.

II.B.3 Industry Size and Geographic Distribution of Traditional Utilities

Ownership Categories and Revenues

Electric utilities are divided into four ownership categories: investor-owned, publicly owned, cooperative-owned, and Federally owned. These categories are described as follows:

- **Investor-owned utilities** produce a return for investors. They either distribute profits to stockholders as dividends or reinvest the profits. Investor-owned utilities are regulated entities that are granted a service monopoly in certain geographic areas and are obliged to serve all consumers and charge reasonable prices.

- **Publicly-owned utilities** are non-profit local government agencies (e.g., municipalities, counties, States, and public utility districts) that serve communities and nearby consumers at cost, returning excess funds to the consumer in the form of community contributions, economic and efficient facilities, and lower rates.

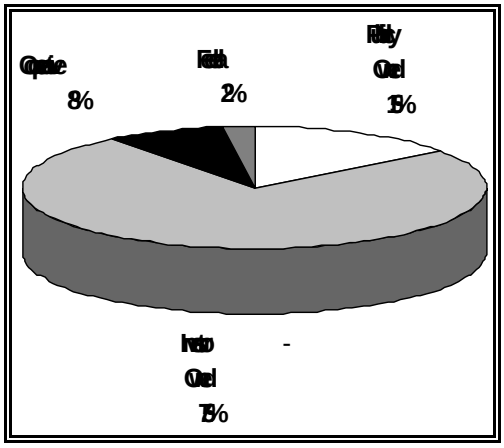
- **Cooperative utilities** are owned by their members and are established to provide electricity to those members. Cooperatives typically provide electric service to small rural communities of 1,500 or less.

- **Federal electrical utilities** do not generate power for profit. The Federal government is primarily a producer and wholesaler of electricity, and

preference in the purchase of the electricity is given to publicly owned and cooperative electric utilities.

In 1995, there were 244 investor-owned, 2,014 publicly owned, 10 Federal, and 931 cooperative utilities. Figure 2 shows the percentage of 1995 U.S. electricity sales to ultimate consumers based on ownership type. Total sales were 1,013 billion kilowatthours. Only a portion of these utilities own and/or operate fossil fuel electric power generation capacity.

Figure 2: Total Utility Electricity Sales to Ultimate Consumers [3]



Among the ownership classes, investor-owned utilities account for more than 75 percent of all retail sales and revenues. In 1995, revenues from major utility generators totaled 208 billion dollars. Table 2 provides the revenues from major utility generators based on ownership category. Tables 3 and 4 list the 1995 top ten investor-owned and publicly owned utilities based on revenues from sales and megawatts sales to ultimate consumers, respectively. It should be noted that these data are for all electric utility activities, not just those that generate electricity.

Table 2: Revenues From Major Utility Generators (1995)	
Ownership Category	**Revenue (billion $)**
Investor-Owned	164
Publicly Owned	26
Cooperative	17
Federal	1
Total	**208**

Source: *Electric Power Annual 1995, Volume II.* U.S. Department of Energy, Energy Information Administration, Washington, DC. July 1996. DOE/EIA-0384(95)/2.

Table 3: Top Ten Investor-Owned Utilities Ranked by Revenue From Sales to Ultimate Consumers (1995)		
Utility Name	**Revenue (thousand dollars)**	**% of Total**
Southern California Edison Co.	7,575,448	4.64
Pacific Gas and Electric Co.	7,569,507	4.63
Commonwealth Edison Co.	6,634,832	4.06
Texas Utilities Electric Co.	5,450,444	3.34
Florida Power & Light Co.	5,325,258	3.26
Consolidated Edison Co. - NY, Inc.	5,005,860	3.07
Virginia Electric & Power Co.	3,979,071	2.44
Georgia Power Co.	3,972,189	2.43
Public Service Electric & Gas	3,886,566	2.38
Duke Power Co.	3,843,227	2.35
Subtotal	**53,242,403**	**32.61**

Source: *Financial Statistics of Major U.S. Investor-Owned Electric Utilities - 1995.* U.S. Department of Energy, Energy Information Administration, Washington, DC. December 1996. DOE/EIA-0437/(95)/1.

Table 4: Top Ten Publicly Owned Generator Utilities Ranked by Megawatt Sales to Ultimate Consumers (1994)

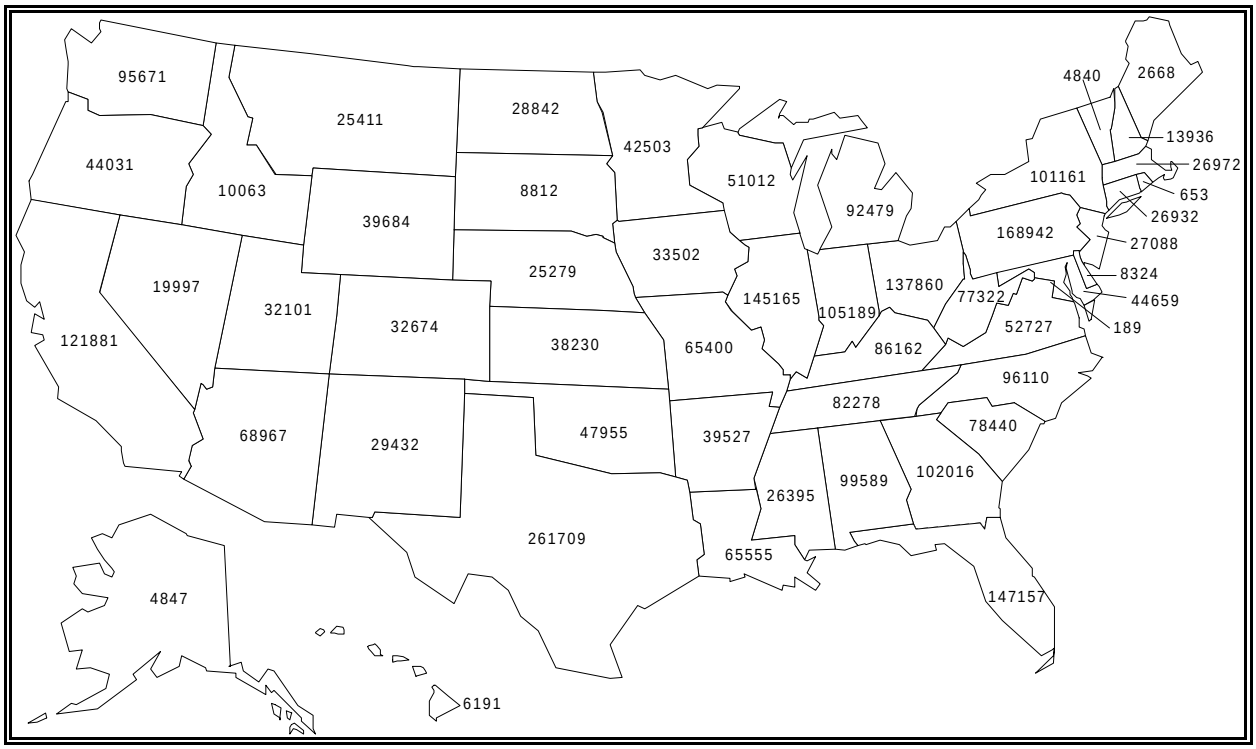
Utility Name	Megawatt Sales	% of Total
City of Los Angeles (CA)	20,430,075	8.61
Salt River Project (AZ)	16,058,298	6.77
Power Authority of State of NY	13,212,615	5.57
San Antonio Public Service Board (TX)	13,027,064	5.49
City of Seattle (WA)	8,874,039	3.74
Jacksonville Electric Authority (FL)	8,817,618	3.72
Sacramento Municipal Utility District (CA)	8,458,156	3.57
South Carolina Public Service Authority	7,423,460	3.13
City of Austin (TX)	7,308,134	3.08
Omaha Public Power District (NE)	7,066,940	2.98
Subtotal	**110,676,399**	**46.65**

Source: *Financial Statistics of Major U.S. Publicly-Owned Electric Utilities - 1994.* U.S. Department of Energy, Energy Information Administration, Washington, DC. December 1995. DOE/EIA-0437/(94)/2.

Geographic Distribution of Utilities

Fossil fuel electric power generation by utilities occurs across the United States. Figure 3 provides the total electric power net generation for each State. Higher values for net generation from utilities generally mirror higher population densities and industrial centers. The States with the highest utility net generation included were California, Texas, Illinois, Ohio, Pennsylvania, and Florida. The amount and geographical distribution of capacity by energy source are a function of availability and price of fuels and/or regulations. Energy sources used by utilities generally show a geographical pattern, such as significant coal and petroleum-fired capacity in the East and gas-fired capacity in the Coastal South.[4]

Figure 3: Geographic Distribution of U.S. Utility Electric Power Net Generation



Source: *Electric Power Annual, 1995, Volume I and II*. U.S. Department of Energy, Energy Information Administration, Washington, DC. July 1996. DOE/EIA-0348(95)/1&2.

Existing Utility Capacity and Electricity Generation

In general, electric power generation utilities use several technologies to generate electric power. These technologies, known as prime movers, are steam turbines, gas turbines, internal combustion engines, combined-cycle, hydraulic turbines, and others (e.g., geothermal, solar, and wind). Combined-cycle facilities use a technology in which electricity is produced from otherwise lost heat exiting from one or more gas (combustion) turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for utilization by a steam turbine in the production of electricity. This process increases the efficiency of the generating unit. Table 5 shows the 1995 existing capacity that employs these technologies and the percent of total U.S. utility capacity. Steam turbines are associated with 77 percent of the total U.S. utility capacity.

Table 5: Existing Capacity of All U.S. Utilities by Prime Mover (fossil fuels, renewable fuels, and other fuels) (1995)		
Prime Mover	**Generating Capacity (megawatts)****	**Percent of Total U.S. Capacity**
Steam Turbines*	579,647	77
Gas Turbines	58,329	7
Internal Combustion	4,985	>1
Combined-Cycle (gas and steam)	14,578	2
Hydraulic Turbines (hydroelectric)	91,114	12
Others	1,888	>1
Total	**750,542**	**100**

* Includes nuclear generators.
** Total may not equal sum of components because of independent rounding.

Source: *Inventory of Power Plants in the United States, as of January 1, 1996.* U.S. Department of Energy, Energy Information Administration, Washington, DC. December 1996. DOE/EIA-0095(95).

Not all of the existing capacity uses fossil fuels. Only a subsection of steam turbine, gas turbine, internal combustion, and combined-cycle capacity (657,539 megawatts) uses fossil fuels. More than 75 percent of the total existing capacity is fossil-fueled. Table 6 presents the 1995 capacity that used fossil fuels for each prime mover. In 1995, approximately 86 percent of the fossil-fueled electric power generation capacity was from steam turbine systems.

Table 6: Fossil-Fueled Utility Capacity by Prime Mover (1995)*		
Prime Mover	**Generating Capacity (megawatts)**	**% of Fossil-Fueled Capacity**
Steam Turbine	475,860	86
Gas Turbine/Internal Combustion	73,166	14
Total	**549,026**	**100**

* Includes combined-cycle capacity.

Source: *Inventory of Power Plants in the United States, As of January 1, 1996.* U.S. Department of Energy, Energy Information Administration, Washington, DC. December 1996. DOE/EIA-0095(95).

Fossil fuel-fired steam electric utilities had the capability to produce 445,627 megawatts of electricity, or more than 50 percent of the net generating capability at U.S. electric utilities. Gas turbine and internal combustion facilities combined had the capability to produce 61,424 megawatts of

electricity, or 11.5 percent of generating capability at U.S. electric utilities in 1995.

In 1995, coal was used as the energy source to generate the most electricity in the utility industry, accounting for net generation of 1,652,914 thousand megawatthours of electricity, consuming 829,007 thousand short tons of coal. Gas-fired generators generated 307,306 thousand megawatthours, consuming 3,196,507 million cubic feet of gas, and petroleum-fired generators generated 60,844 thousand megawatthours of electricity, consuming 102,150 thousand barrels of petroleum (not including petroleum coke). Many utility generators have the flexibility to switch fuel sources in response to market conditions. Table 7 provides the 1995 U.S. utility generating capacity and net generation for each fossil fuel energy source.

Table 7: Utility Generating Capability and Net Generation by Energy Source (1995)

Energy Source	Generating Capability (megawatts)	Net Generation (thousand megawatthours)
Coal	301,484	1,652,914
Gas	135,749	307,306
Petroleum	70,043	60,844
Total	**507, 276**	**2,020,822**

Source: *Electric Power Annual, 1995, Volume 1.* U.S. Department of Energy, Energy Information Administration, Washington, DC. July 1996. DOE/EIA-0348(95/1).

II.B.4 Industry Size and Geographic Distribution of Nonutilities

Nonutility Classifications

There are three categories of nonutilities:

- **Cogeneration** is the major technology used among nonutility power producers. This technology, which is discussed in greater detail in Section III, is the combined production of electric power and another form of useful energy (e.g., heat or steam). To receive QF status under PURPA, a cogeneration facility must meet certain operating criteria to "produce electrical energy and another form of useful thermal energy through the sequential use of energy." Depending upon the technology used, a facility may also be required to meet specific efficiency criteria. QFs are guaranteed that electric utilities will purchase their output at the incremental cost that an electric utility would incur to produce or purchase an amount of power equivalent to that purchased from QFs. QFs are also guaranteed that electric utilities will provide backup service at prevailing (non-discriminatory) rates.

Fossil-fueled steam turbine systems are used in most industrial applications of cogenerating processes, while gas turbine systems are used in most other processes (e.g., commercial). Diesel engine systems are limited in their application to cogeneration because they provide less useable process heat per unit of electric power input.

- **Small Power Producers** are designated under PURPA regulations based on fuel consumption of a renewable energy source greater than 75 percent. This means that most nonutility fossil fuel electric power generators are not likely to carry this designation. In limited cases however, a facility may use fossil fuel in conjunction with a renewable energy source.

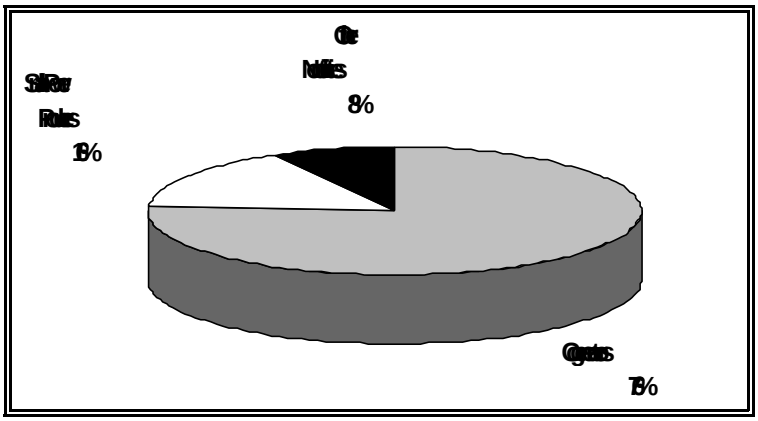
- **Other Nonutility Generators** are facilities not classified in the previous categories that produce electric power for their own use and for sale to electric utilities. These facilities include:

  - Independent power producers (IPPs)
  - Nonqualifying cogenerators
  - Exempt wholesale generators (EWGs)
  - Other commercial and industrial establishments.

FERC defines IPPs as producers of electric power other than QFs that are unaffiliated with franchised utilities in the IPP's market area and that for other reasons lack significant market power. The IPPs may lack market power due to siting or access to transmission. The EWGs are engaged exclusively in the business of wholesale electric generation and are exempt from corporate organizational restrictions under the Public Utility Holding Company Act of 1935.

In 1995, the makeup of the nonutility industry, based on capacity, included 76.2 percent cogenerators, 15.8 percent small power producers, and 8 percent other nonutility producers. Figure 4 illustrates the percent capacity of the different classes of nonutility power producers.[5]

Figure 4: Nonutility Capacity by Type of Producer



Qualified facilities comprised 78 percent of the total nonutility capacity in 1995. Non-qualified facilities were 12.9 percent of the capacity.

Nonutility power generation facilities and activities may be found in association with commercial and industrial facilities. Table 8 lists SIC codes and industries where power generation facilities and activities may be found.

In 1995, nonutility generation capacity within the chemical industry (SIC Code 28) accounted for 21 percent of the nonutility capacity and 23 percent of the total nonutility generation. The paper industry (SIC Code 26) accounted for 17 percent of the nonutility capacity and 18 percent of the generation. The coal, oil, and gas mining and refining industries (SIC Codes 12, 13, and 29) accounted for 12 percent of the total nonutility capacity and 13 percent of the generation.[6]

Table 8: Major SIC Codes and Industrial Categories Where Nonutility Power Generation Activities Are Found

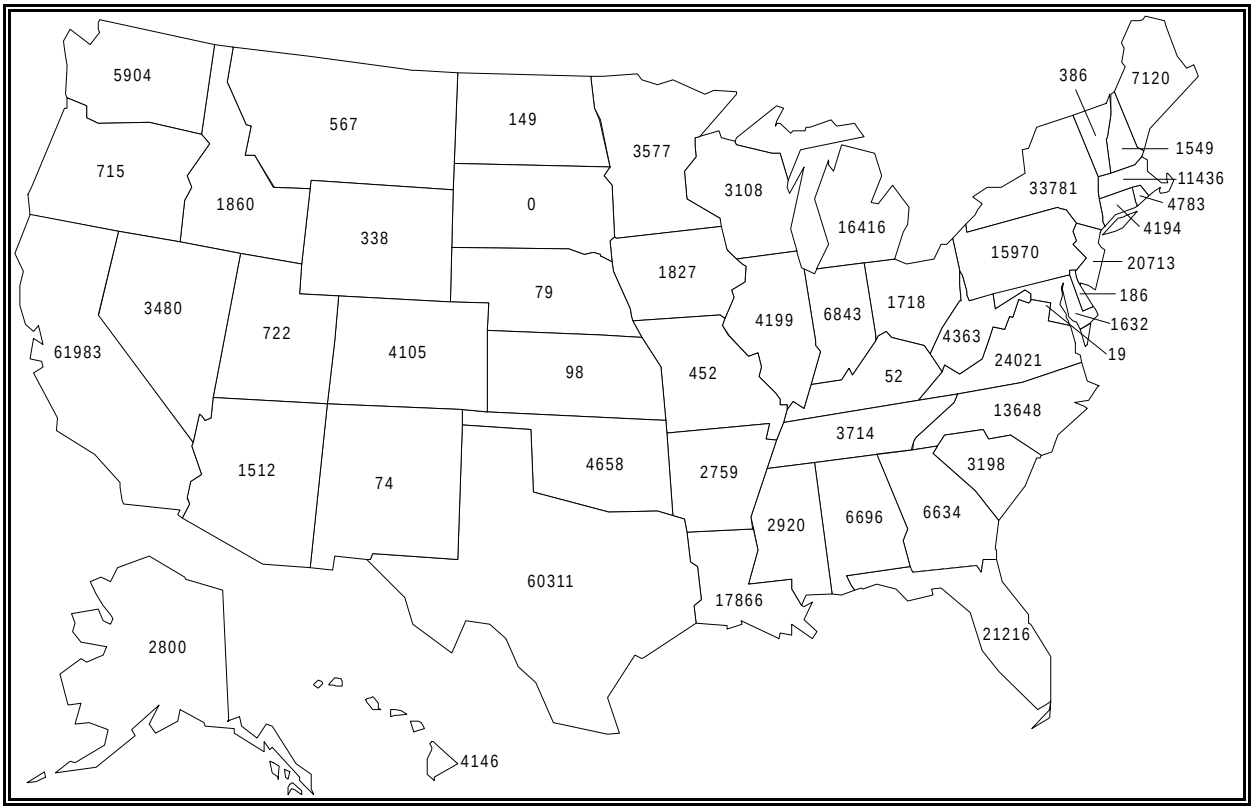
Major SIC Code	Industrial Category
01, 02	Agricultural Production - Crops, Livestock, and Animals
07	Agricultural Services
10	Metal Mining
12	Coal Mining
13	Oil and Gas Extraction
20	Food and Kindred Products
21	Tobacco Products
22	Textile Mill Products
23	Apparel & Other Finished Fabric Products
24	Lumber and Wood Products (Except Furniture)
25	Furniture and Fixtures
26	Paper and Allied Products
27	Printing, Publishing, and Allied Industries
28	Chemicals and Allied Products
29	Petroleum Refining and Related Industries
30	Rubber and Miscellaneous Plastics Products
31	Leather and Leather Products
32	Stone, Clay, Glass, and Concrete Products
33	Primary Metal Industries
34	Fabricated Metal Products (Except Machinery)
35	Industrial and Commercial Machinery/Computer Equipment
36	Electronic and Other Electrical Equipment
37	Transportation Equipment
38	Measuring, Analyzing, and Controlling Instruments
39	Jewelry, Silverware, and Plated Silver
42, 45, 47, 48, 49	Transportation, Communications , Electric, Gas, and Sanitary Services
53, 54, 55, 58	Retail Trade
60, 65	Finance, Insurance, and Real Estate
70, 72, 80, 82, 83, 84, 86, 87	Services
91, 92, 97	Public Administration

Source: *Directory of U.S. Cogeneration, Small Power, and Industrial Power Plants.* June 1995.. Giles, Ellen and Fred Yost. Twelfth Edition. Utility Data Institute, A Division of McGraw- Hill Company. UDI-2018-95.

Geographic Distribution of Nonutilities

Fossil fuel electric power generation by nonutilities occurs all across the United States. Figure 5 provides the total nonutility electric power net generation for each State. As with the utilities, higher values for net generation for nonutilities generally mirror higher population densities and industrial centers. The States with the highest nonutility net generation included were California, Texas, Virginia, New York, Florida, and New Jersey.

Figure 5: Geographic Distribution of U.S. Nonutility Electric Power Net Generation



Source: *Electric Power Annual Volume I and II.* July 1995. U.S. Department of Energy, Energy Information Administration, Washington, DC. DOE/EIA-0348(95)/1&2.

Existing Nonutility Capacity and Electricity Generation

As in the traditional utilities, nonutilities use steam turbines, gas turbines, internal combustion engines, hydraulic turbines, and combined-cycle systems to generate electricity. Steam turbines accounted for 42 percent of all the capacity and combined-cycle generating systems accounted for 27 percent. Table 9 provides existing 1995 nonutility generating capacity by prime mover technology.

The majority (more than 68 percent) of existing 1995 nonutility capacity is attributed to fossil-fueled electricity production.[7] Many facilities are able to switch from one fossil fuel to another if the fuel supply is interrupted or the economics warrant it. Some facilities are even able to switch from fossil fuels to renewable energy sources, while still others can use combustors that can burn two or more different fuels simultaneously, in varying combinations, to generate a desired heat output. Thus, the nonutility industry can be very adaptable, depending upon the type of equipment at a facility and based on

economic conditions. Table 10 provides the 1995 nonutility capacity associated with each fossil fuel energy source.

Table 9 : Existing Capacity of Nonutilities by Prime Mover (1995)

Prime Mover	Generating Capacity (megawatts)	Percent of Total U.S. Capacity
Steam Turbines	28,192	42
Combined-Cycle	17,417	27
Gas Turbines	12,081	18
Internal Combustion	2,018	3
Hydraulic Turbines	3,410	5
Others*	3,297	5
Total	**66,415**	**100**

* Includes nuclear generators.

Source*: 1995 Capacity and Generation of Nonutility Sources of Energy*. Edison Electric Institute, Washington, DC. November 1996.

Table 10: Nonutility Capacity by Fossil Fuel Energy Source (1995)

Fossil Fuel	Generating Capacity (megawatts)	Percent of Total Fossil Fuel Nonutility Capacity
Gas	33,221	73
Coal	10,324	23
Petroleum	1,657	4
Total	**45,202**	**100**

Source*: 1995 Capacity and Generation of Nonutility Sources of Energy*. Edison Electric Institute, Washington, DC. November 1996.

The majority of the nonutility power producers use fossil fuels to generate electricity. Fossil fuels accounted for more than 287 million megawatthours, which was 72 percent of the total electricity produced by nonutilities in 1995.[8]

Gas was the fossil fuel used to generate the most electricity in the nonutility industry, providing a total of 213 million megawatthours of electricity in 1995. Coal was used to produce 70 million megawatthours of electricity, and petroleum was used to produce 4 million megawatthours of electricity. Table 11 provides 1995 nonutility generation by power producer class and energy source.

Table 11: 1995 Nonutility Net Generation by Primary Fossil Fuel Energy Source and Type of Producer (thousand megawatthours)

Energy Source	Cogenerators	Small Power Producers	Other Nonutility Power Producers	Total U.S. Nonutility Generation
Gas	200,080	0	13,357	213,437
Coal	63,440	0	6,740	70,180
Petroleum	3,957	0	121	4,079
Total	**267,477**	**0**	**20,218**	**287,696**

Source*: 1995 Capacity and Generation of Nonutility Sources of Energy*. Edison Electric Institute, Washington, DC. November 1996.

II.B.5 Economic Trends

Change in Structure of the Utility Electric Power Industry

Utility electric power generation is one of the largest industries that remains regulated in the United States. Change is rapidly occurring in this industry due to the issuance by the FERC of Orders 888 and 889 (dated April 24, 1996), which encourage wholesale competition. Order 888 deals with issues of open access to transmission networks and stranded costs; Order 889 requires utilities to establish systems to share information on the availability of transmission capacity. To date, many States have initiated activities related to retail competition, and legislative proposals have been introduced into the U.S. Congress on restructuring the electric power industry.

With a competitive industry structure eminent, investor-owned utilities have been downsizing staff and reorganizing their company structures to lower costs. They have lowered costs by taking advantage of lower fuel prices and modifying fuel acquisition procedures. This has resulted in lower operation and maintenance costs. Some large investor-owned utilities have begun to expand their business investments into such areas as energy service companies; oil and gas exploration, development, and production; foreign ventures; and telecommunications. Numerous utilities are planning to improve their position in a competitive market through mergers and acquisitions. In 1995, 13 investor-owned utilities merged or had mergers pending.[9]

Publicly owned and cooperative utilities are expected to be affected by the posturing of the investor-owned companies. Although they can sell electricity at a competitive price, increased competition from investor-owned utilities and electricity marketing companies may require them to lower costs.

Many have already begun to reduce staff and engage in other cost-cutting measures. Mergers are also expected to occur among public utilities, however, not at the same rate as the investor-owned.

Stranded costs are a major concern for this industry as they move to a competitive market. Stranded costs are costs that have been incurred by the utilities to serve their consumers but cannot be recovered if the consumers choose other electricity suppliers. Estimates of stranded costs have been from $10 to $500 billion. Currently, utilities are looking for ways to mitigate stranded costs, and regulators are looking at alternatives for recovering these costs.[10]

The structure of the electric power industry is undergoing other changes. In the past, the electric power industry has been dominated by utilities, especially regulated investor-owned utilities. It is expected that utility generators will continue to dominate capacity in the United States, increasing from 703 gigawatts in 1995 to 724.4 gigawatts in 2015. In addition, nonutilities will continue to increase their role in the industry. Recent legislation has had an effect. For example, PURPA in 1978 has allowed QF status, and the Energy Policy Act of 1992 (EPACT) has removed constraints on utility ownership of significant shares of nonutility producers. In 10 years (1985-1995), the nonutility role in U.S. electric power industry has grown from 4 percent to 11 percent of the total generation.[11]

With the advent of a more competitive market, a new type of firm called "power marketers" has arisen in the electric power generation industry. Power marketers buy electric energy and transmission and other services from utilities, or other suppliers, and resell the products for profit. This practice started in the late 1980s, and growth in this market has increased competition in the wholesale market. Nine wholesale marketers existed in 1992; 180 existed by the end of 1995. The growth and success of power marketers signal a potential for fundamental change in the wholesale electricity business.

Projected Growth in the Power Generation Industry

Demands for electricity have slowed in recent years due to several factors. These factors include market saturation of electric appliances, improvements in equipment efficiency, utility investments in demand-side management programs, and legislation establishing more stringent equipment efficiency standards. In the 1960s, electricity demand grew by more than 7 percent a year. By the 1980s, this growth had slowed to only 1 percent per year. A further decline in growth is expected into the next century.[12]

Despite the slower demand growth, 319 gigawatts of new generating capacity are expected to be needed by 2015. This need is both a result of the demand and because of the amount of capacity that is expected to be retired. In particular, approximately 38 percent of the existing nuclear capacity is expected to be retired, in addition to 16 percent of the existing fossil-fueled steam turbine capacity. Of the new capacity needed, 81 percent is projected to be combined-cycle or combustion turbine technology expected to be fueled with natural gas or both oil and gas. Both of these technologies supply peak and intermediate capacity, but combined-cycle units can also be used to meet baseload requirements.

Before building new capacity, many utilities are exploring other alternatives to meet the growth demand. Some of these alternatives are life extension and repowering, power imports, demand-side management programs, and purchase from cogenerators. Even with these alternatives, a projected 1,063 new plants (assuming approximately 300 megawatts capacity per plant) will be needed by 2015 to meet the growing demand and to offset the retirements.[13]

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